4D STEEL (SIC 331)

EPA's *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* identified five 4-digit SIC codes in the Steel Works, Blast Furnaces, and Rolling and Finishing Mills Industries (SIC 331) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws more than two million gallons per day (MGD) from a water of the United States, and uses at least 25 percent of its intake flow for cooling purposes (facilities with these characteristics are hereafter referred to as "§316(b) facilities"). For each of the five SIC codes, Table 4D-1 below provides a description of the industry sector, a list of primary products manufactured, the total number of screener respondents, and the number and percent of §316(b) facilities.

Table 4D-1: §316(b) Facilities in the Steel Industry (SIC 331)

SIC	SIC Description	Important Products Manufactured	Number of Screener Respondents		
			Total	§316(b) Facilities	
				No.†	%
Steel Mills (SIC 3312)					
3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills	Hot metal, pig iron, and silvery pig iron from iron ore and iron and steel scrap; converting pig iron, scrap iron, and scrap steel into steel; hot-rolling iron and steel into basic shapes, such as plates, sheets, strips, rods, bars, and tubing; merchant blast furnaces and byproduct or beehive coke ovens	***158***	***38***	***24.1%***
Steel Products (SICs 3315, 3316, 3317)					
3315	Steel Wiredrawing and Steel Nails and Spikes	Drawing wire from purchased iron or steel rods, bars, or wire; further manufacture of products made from wire; steel nails and spikes from purchased materials	122	3	2.5%
3316	Cold-Rolled Steel Sheet, Strip, and Bars	Cold-rolling steel sheets and strip from purchased hot-rolled sheets; cold-drawing steel bars and steel shapes from hot-rolled steel bars; producing other cold finished steel	60	9	15.0%
3317	Steel Pipe and Tubes	Production of welded or seamless steel pipe and tubes and heavy riveted steel pipe from purchased materials	130	1	0.8%
Total Steel Products			***312***	***13***	***4.2%***
Other Sectors					
3313	Electrometallurgical Products, Except Steel	Ferro and nonferrous metal additive alloys by electrometallurgical or metallothermic processes, including high percentage ferroalloys and high percentage nonferrous additive alloys	***6***	***1***	***16.7%***
Total Steel (SIC 331)					
Total 331			**476**	**52**	**10.9%**

† Information on the percentage of intake flow used for cooling purposes was not available for all screener respondents. Facilities for which this information was not available were assumed to use at least 25% of their intake flow for cooling water purposes The reported numbers of §316(b) facilities may therefore be overstated.

Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures; Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual 1987

The responses to the Screener Questionnaire indicate that two main steel sectors account for the largest numbers of §316(b) facilities: (1) Steel Mills (SIC code 3312) and (2) Steel Products (SIC codes 3315, 3316, and 3317). Of the 52 §316(b) facilities in the steel industry 38, or 73 percent, are steel mills, and 13, 25 percent, are steel products facilities. The remainder of the steel industry profile therefore focuses on these two industry sectors.

4D.1 Domestic Production

Steel is one of the dominant products in the U.S. industrial metals industry. For most of the twentieth century the U.S. steel industry consisted of a few large companies utilizing an integrated steelmaking process to produce the raw steel used in a variety of commodity steel products. The integrated process requires massive capital investment to process coal, iron ore, limestone, and other raw materials into molten iron, which is then transformed into finished steel products (S&P, 2000). In recent decades, the integrated steel industry has undergone a dramatic downsizing as a result of increased steel imports, decreased consumption by the auto industry, and the advent of minimills, small regional steelmakers producing limited products and using a less capital-intensive process (S&P, 2000).

The steel industry is the fourth largest energy-consuming sector. Energy costs account for approximately 20 percent of the total cost to manufacture steel. Steelmakers use coal, oil, electricity, and natural gas to fire furnaces and run process equipment. Minimill producers require large quantities of electricity to operate the electric arc furnaces used to melt and refine scrap metal while integrated steelmakers are dependent on coal for up to 60 percent of their total energy requirements (McGraw-Hill, 1998).

a. Output

The two most common measures of manufacturing output are ***value of shipments*** and ***value added***.[1] Historical trends provide insight into the overall economic health and outlook for an industry. Value of shipments is the sum of the receipts a manufacturer earns from the sale of its outputs. It is an indicator of the overall size of a market or the size of a firm in relation to its market or competitors. Value added is used to measure the value of production activity in a particular industry. It is the difference between the value of shipments and the value of inputs used to make the products sold.

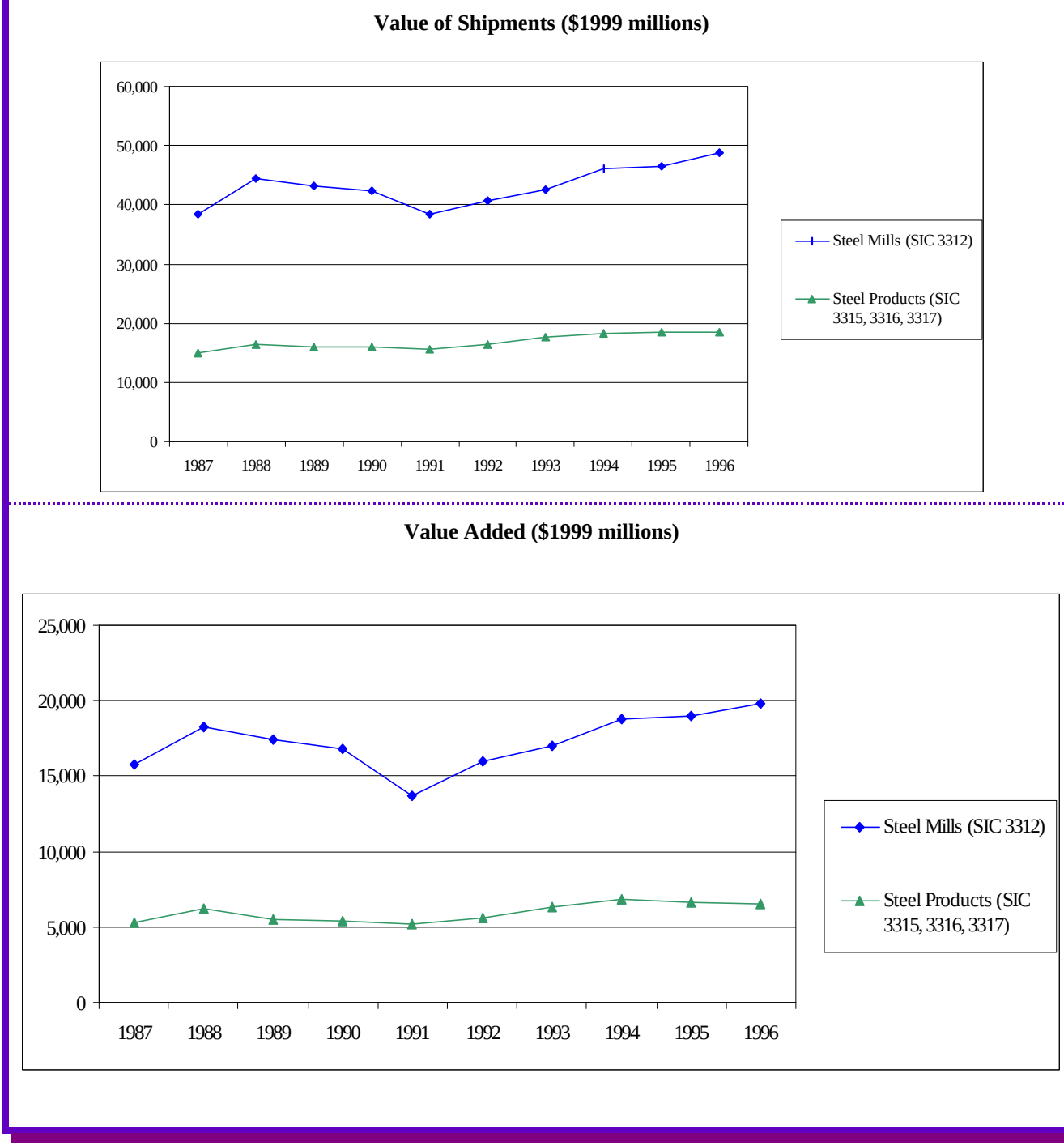
Figure 4D-1 presents the trend in value of shipments and value added for steel mills and steel products. The steel products sector experienced a slow yet steady increase in both value of shipments and value added between 1987 and 1996. This upward trend is the result of the increasing global demand for steel due to growing automotive and construction markets and stronger economies in developing regions with substantial infrastructure needs (McGraw-Hill, 1998).

Between 1987 and 1996, value of shipments and value added for steel mills have increased by 27 and 26 percent, respectively. The most significant gains occurred after the demand for steel mill products bottomed out in the early 1990s. There is a strong link between the U.S. steel industry and the auto and construction industries and the national economy overall. The economic expansion in recent years has increased demand for steel products. Another important factor in the resurgence in the demand for steel mill products is the technological advancements that have improved the competitiveness of U.S. steel. The development of the thin slab caster/rolling mill in 1989 allowed minimills to produce flat rolled steel, which accounts for 60 percent of domestic shipments, with substantially lower capital and energy costs (McGraw-Hill, 1998).

Figure 4D-1 shows the trend in value of shipments and value added for the two profiled steel sectors between 1987 and 1996.

[1] Terms highlighted in bold and italic font are further explained in the glossary.

Figure 4D-1: Real Value of Shipments and Value Added for Profiled Steel Industry Sectors ($1999 million)



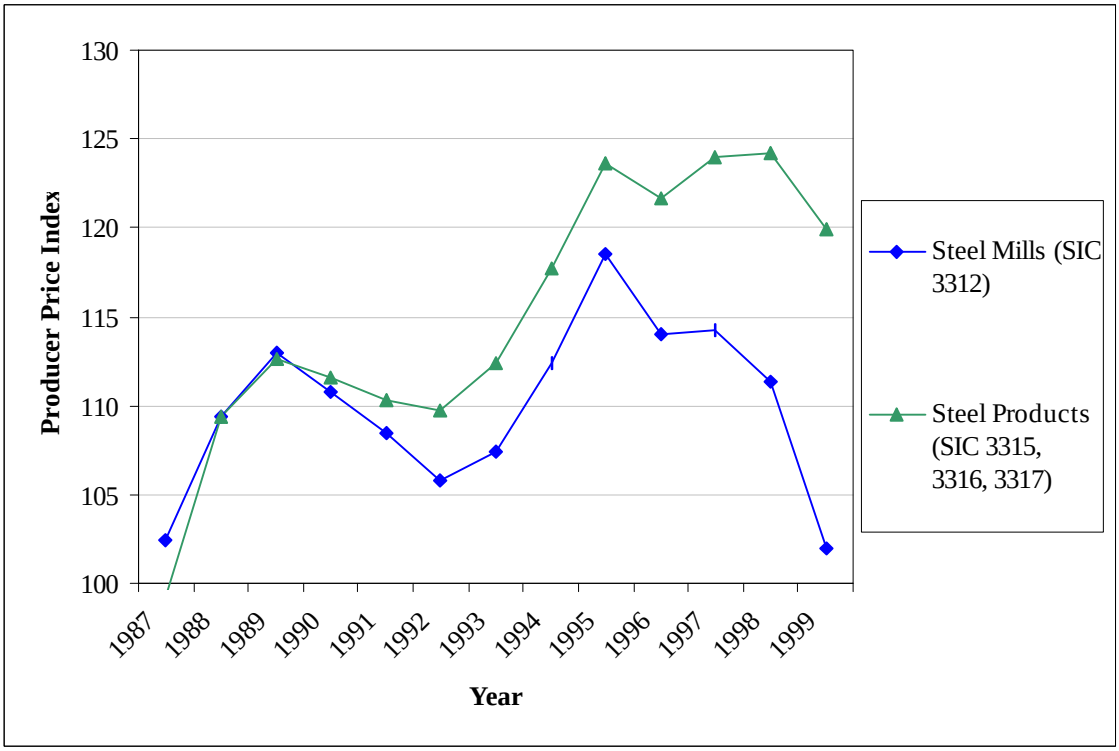
Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

b. Prices

The ***Producer Price Index*** (PPI) is a family of indexes that measure price changes from the perspective of the seller. It is an indicator of product prices and is used to inflate nominal monetary values to constant dollars. This profile uses PPIs at the 4-digit SIC code level to convert nominal values to 1999 dollars.

Figure 4D-2 below shows that selling prices for steel products and steel mill products follow very similar trends. Prices increased from 1987 to 1989 and then decreased until bottoming out in 1993. After this decrease, prices rebounded sharply through 1995 before eroding again. The decrease in prices between 1988 and 1992 reflects the sharp decrease in demand for steel products which resulted, in part, from a declining global economy and decreases in the demand for consumer durable goods, such as cars and appliances. This decrease in demand for steel-containing products led to an oversupply in steel and a substantial decline in prices. The recovery in prices reflects a general economic recovery and the concomitant increase in demand for steel products from the auto and construction markets. The fluctuation in prices since the mid 1990s reflects the limited ability of steel makers to raise prices despite increased demand. An increased supply in low cost imports from foreign sources has kept prices from increasing significantly (McGraw-Hill, 1998).

Figure 4D-2: Producer Price Index for Profiled Steel Industry Sectors



Source: Bureau of Labor Statistics, Producer Price Index.

c. Number of Facilities and Firms

The number of steel mills fluctuated significantly between 1989 and 1996. Table 4D-2 shows substantial decreases in the number of facilities in 1992 and 1993 due to a significant decrease in the global demand for steel products and the resulting overcapacity. This decrease was followed by a significant recovery in 1995 and 1996. The reversal reflects the increased use of steel by the major steel using industries such as construction (McGraw-Hill, 1998). The increase in demand for steel led to an expansion in steelmaking capacity which has been increasingly dominated by smaller, more energy efficient minimills in favor of the larger integrated mills (S&P, 2000).

In contrast to the volatility in the number of steel mills, the number of facilities in the Steel Products sector has remained relatively stable for the past eight years with only small decreases between 1994 and 1996.

Table 4D-2: Number of Facilities in the Profiled Steel Industry Sectors

Year	Steel Mills (SIC 3312)		Steel Products (SIC 3315, 3316, 3317)	
	Number of Facilities	Percent Change	Number of Facilities	Percent Change
1989	476	n/a	784	n/a
1990	497	4.4%	776	-1.0%
1991	531	6.8%	807	4.0%
1992	412	-22.4%	831	3.0%
1993	343	-16.7%	833	0.2%
1994	339	-1.2%	804	-3.5%
1995	391	15.3%	791	-1.6%
1996	483	23.5%	770	-2.7%
Percent Change 1989-1996		1.5%		-1.8%

Source: Small Business Administration, Statistics of U.S. Businesses.

The trend in the number of firms over the period between 1990 and 1996 has been similar to the trend in the number of facilities in both industry sectors. The number of firms in the Steel Mill sector decreased from a high of 433 in 1991 to a low of 258 in 1994. This decrease was followed by an expansion in the number of firms to 397 in 1996, an increase of more than 53 percent in two years. The number of firms in the Steel Products sector has decreased steadily in recent years from its peak of 661 in 1992.

Table 4D-3 shows the number of firms in the two profiled steel sectors between 1990 and 1996.

Table 4D-3: Number of Firms in the Profiled Steel Industry Sectors

Year	Steel Mills (SIC 3312)		Steel Products (SIC 3315, 3316, 3317)	
	Number of Firms	Percent Change	Number of Firms	Percent Change
1990	408	n/a	597	n/a
1991	433	6.1%	635	6.4%
1992	321	-25.9%	661	4.1%
1993	261	-18.7%	641	-3.0%
1994	258	-1.1%	618	-3.6%
1995	309	19.8%	607	-1.8%
1996	397	28.5%	583	-4.0%
Percent Change 1990-1996		-2.7%		-2.3%

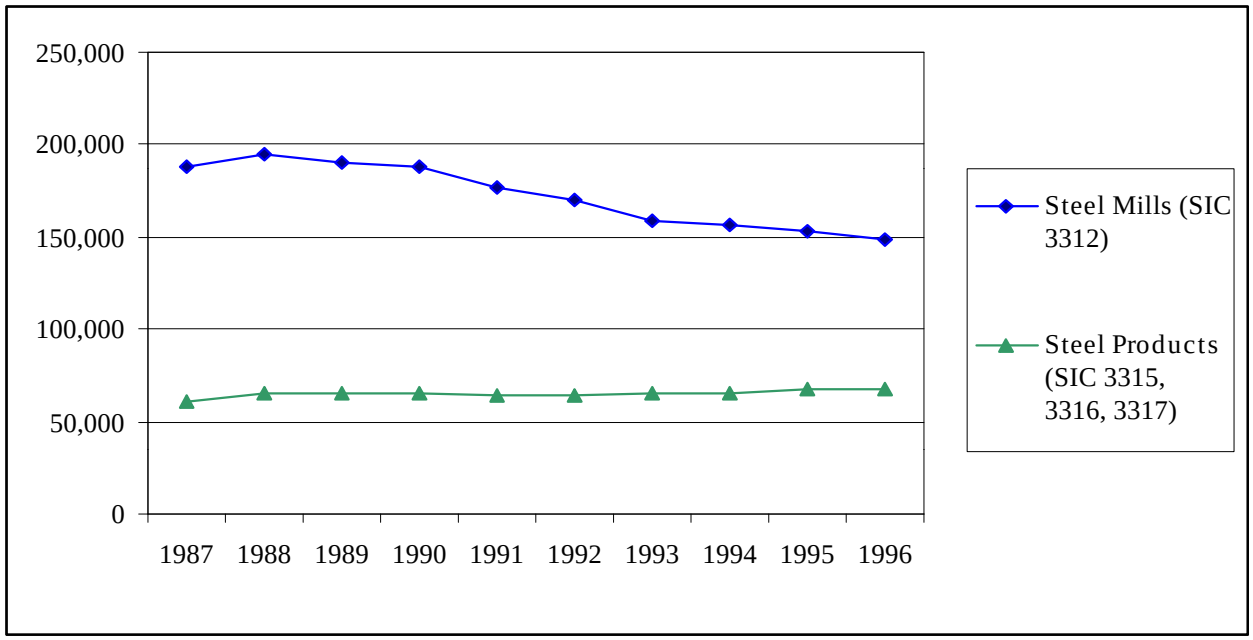
Source: Small Business Administration, Statistics of U.S. Businesses.

d. Employment and Productivity

Employment is a measure of the level and trend of activity in an industry. Figure 4D-3 below provides information on employment from the Annual Survey of Manufactures for the Steel Mills and Steel Products sectors. The figure shows that employment levels in the Steel Mills industry decreased by a total of 21 percent between 1987 and 1996. Employment is a primary cost component for steelmakers, accounting for approximately 30 percent of total costs (McGraw-Hill, 1998). Lowering labor costs enabled the steel mills to improve profitability and competitiveness given the limited opportunity to raise prices in the competitive market for steel products. The steady declines in employment reflects the aggressive efforts made by steel mills to improve worker productivity in order to cut labor costs and improve profits (McGraw-Hill, 1998).

Employment in the Steel Products sector over the same time period shows a steady positive trend, increasing by 12 percent between 1987 and 1996. This increase in employment is due to continued growth in the demand for steel products driven by a strong market for steel-containing durable goods and the increased steel-intensity of the economy, including a significant increase in the use of steel by the construction industry (McGraw-Hill, 1998).

Figure 4D-3: Employment for Profiled Steel Industry Sectors



Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

Table 4D-4 presents the change in value added per labor hour, a measure of ***labor productivity***, for the Steel Mill and Steel Products sectors between 1987 and 1996. Labor productivity at steel mills has increased substantially over this time period. Value added per labor hour increased 47 percent between 1987 and 1996. This increase reflects the efforts by steel mills to improve worker productivity in order to cut labor costs and improve profits. Much of the increase in labor productivity can be attributed to the restructuring of the U.S. steel industry and the increased role of minimills in production. Minimills are capable of producing rolled steel from scrap with substantially lower labor needs than integrated mills (McGraw-Hill, 1998). Labor productivity in the steel products sector has fluctuated somewhat but remained generally stable, increasing five percent from 1987 to 1996.

Table 4D-4: Productivity Trends for the Profiled Steel Industry Sectors, Millions of $1999

Year	Steel Mills (SIC 3312)				Steel Products (SIC 3315, 3316, 3317)			
	Value Added	Production Hours (millions)	Value Added/Hour		Value Added	Production Hours (millions)	Value Added/Hour	
			Number	Percent Change			Number	Percent Change
1987	15,743	306	51	n/a	5,289	96	55	n/a
1988	18,233	324	56	9%	6,195	103	60	9%
1989	17,455	348	50	-11%	5,550	104	53	-11%
1990	16,831	315	53	7%	5,438	105	52	-3%
1991	13,707	279	49	-8%	5,151	101	51	-1%
1992	15,974	277	58	17%	5,649	101	56	10%
1993	17,008	268	64	10%	6,278	107	59	5%
1994	18,824	266	71	11%	6,821	108	63	7%
1995	18,939	262	72	2%	6,589	113	58	-7%
1996	19,784	260	76	5%	6,578	114	58	-1%
Percent Change 1988-1996				15%				11%

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

e. Capital Expenditures

Steel production is a relatively capital intensive process. Capital-intensive industries are characterized by large, technologically complex manufacturing facilities which reflect the economies of scale required to manufacture products efficiently. The integrated production process requires large capital investments of approximately $2,000 per ton of capacity for plants and equipment to support the large-scale production capacities needed to keep unit costs low. The nonintegrated process employed in minimills is significantly less capital intensive with capital costs of approximately $500 per ton of capacity (McGraw-Hill, 1998).

New capital expenditures are needed to modernize, expand, and replace existing capacity to meet growing demand. Capital expenditures in the Steel Mills and the Steel Products sectors between 1987 and 1996 are presented in Table 4D-5 below. The table shows that while capital expenditures in the Steel Mills sector haveexperienced dramatic fluctuations from one year to another, the level of capital expenditures by Steel Mills more than doubled between 1987 and 1996. The majority of this increase was realized in the late 1980s and early 1990s when capital expenditures increased by a total of 131 percent from 1987 to 1991. This substantial increase coincides with the advent of thin slab casting, a technology that allowed minimills to compete in the market for flat rolled sheet steel. Thin slab casting is the industry's largest and most lucrative segment,

accounting for approximately 60 percent of demand. The significant decreases in capital expenditures by steel mills that followed this expansion reflects the bottoming out of the demand for steel products in the early 1990s. The recovery in capital expenditures in the mid 1990s has likely resulted from the recovery in the demand for steel which is due to an increase in the steel-intensity of the economy and growth in important end use markets (McGraw-Hill, 1998).

The 20 percent growth in the Steel Products sector has been much more modest, but the fluctuations are equally dramatic.

Table 4D-5: Capital Expenditures for the Profiled Steel Industry Sectors ($1999 millions)

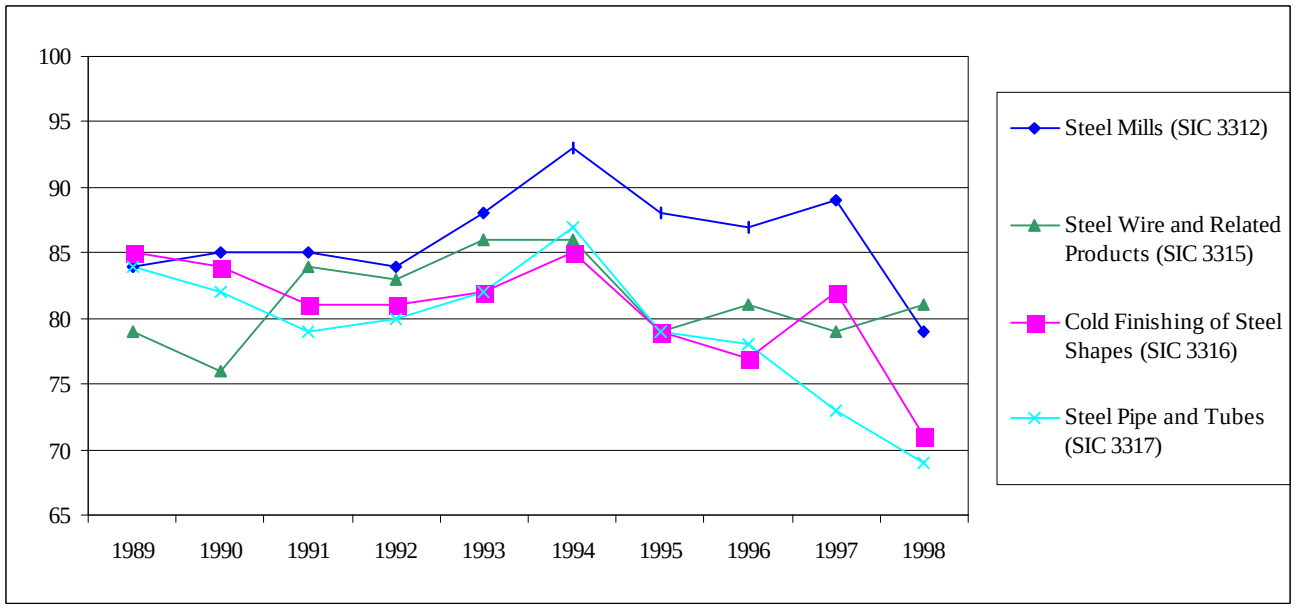
Year	Steel Mills (SIC 3312)		Steel Products (SIC 3315, 3316, 3317)	
	Capital Expenditures ($1999 millions)	Percent Change	Capital Expenditures ($1999 millions)	Percent Change
1987	1,216	n/a	478	n/a
1988	1,765	45.2%	351	-26.7%
1989	2,255	27.8%	499	42.2%
1990	2,351	4.3%	489	-1.9%
1991	2,810	19.5%	385	-21.4%
1992	2,131	-24.2%	388	0.7%
1993	1,689	-20.7%	410	5.9%
1994	2,372	40.4%	522	27.2%
1995	2,365	-0.3%	490	-6.1%
1996	2,522	6.6%	576	17.4%
Percent Change 1987-1996		107.4%		20.5%

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

f. Capacity Utilization

Capacity utilization measures actual output as a percentage of total potential output given the available capacity and is used as a key barometer of an industry's health. Capacity utilization is an index used to identify potential excess or insufficient capacity in an industry which can help to project whether new investment is likely. Figure 4D-4 presents the capacity utilization index from 1989 to 1998 for the 4-digit SIC codes that make up the Steel Mill and Steel Products sectors. As shown in the figure, the index follows similar trends in each SIC code. For all sectors, capacity utilization peaked in 1994 and has decreased through the late 1990s. This trend reflects the over-capacity in the U.S. steel industry that has followed the substantial capacity additions in the late 1980s and early 1990s.

Figure 4D-4: Capacity Utilization Index for Profiled Steel Industry Sectors



Source: Department of Commerce, U.S. Census Bureau, Current Industrial Reports, Survey of Plant Capacity.

4D.2 Structure and Competitiveness of the Steel Industry

The companies that manufacture steel operate in a highly capital intensive industry. The steel mill industry is comprised of two different kinds of companies, integrated mills and minimills. The integrated steelmaking process requires expensive plant and equipment purchases that will support production capacities ranging from two million to four million tons per year. Until the early 1960s integrated steelmaking was the dominant method of steel manufacturing in the U.S. Since then, the integrated steel business has undergone dramatic downsizing due in part to the advent of minimills, increased imports, and reduced consumption by the auto industry which caused the industry to lose a substantial amount of tonnage. The increased unit costs as a result of decreases in tonnage has caused bankruptcy, plant closures, and mergers. These trends have reduced the number of integrated steelmakers (S&P, 2000).

Minimills vary in size from capacities of 150,000 tons at small facilities to larger facilities with annual capacities of between 400,000 tons and two million tons. Integrated companies have significant capital costs of approximately $2,000 per ton of capacity compared with minimills' $500 per ton. Because their production method does not require as much of an investment in capital equipment as integrated steelmakers, minimills have been able to lower prices driving integrated companies out of many of the commodity steel markets (S&P, 2000).

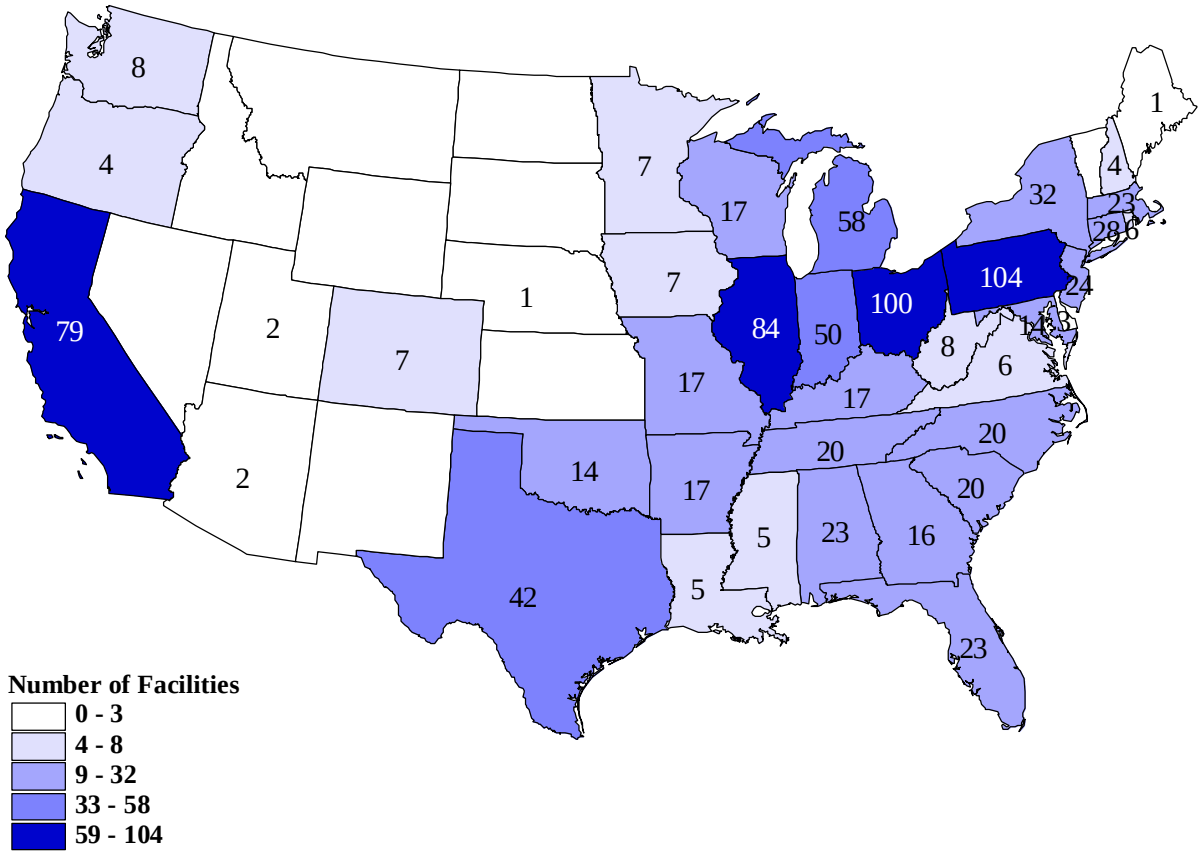
The large reduction in the initial capital investment has made it easier for minimills to enter the market. There were 22 publicly listed producers in the U.S. steel market as of late 1999, a sharp contrast to the oligopoly that prevailed earlier in this century (S&P, 2000).

a. Geographic Distribution

Steel mills are primarily concentrated in the Great Lakes Region (New York, Pennsylvania, Ohio, Indiana, Illinois, and Michigan). Historically, mill sites were selected for their proximity to water (both for transportation and for use in cooling and processing) and the sources of their raw materials, iron ore and coal. The geographic concentration of the industry has begun to change as minimills can be built anywhere where electricity and scrap are available at a reasonable cost and where a local market exists (EPA, 1995). The Steel Products sector is concentrated in the Great Lakes region and California. Ohio, Illinois, Pennsylvania, Michigan, and California manufactured 41 percent of all steel products in the U.S.

Figure 4D-5 below shows the distribution of U.S. steel mills and steel products facilities.

Figure 4D-5: Geographical Distribution of Facilities in the Profiled Steel Industry Sectors



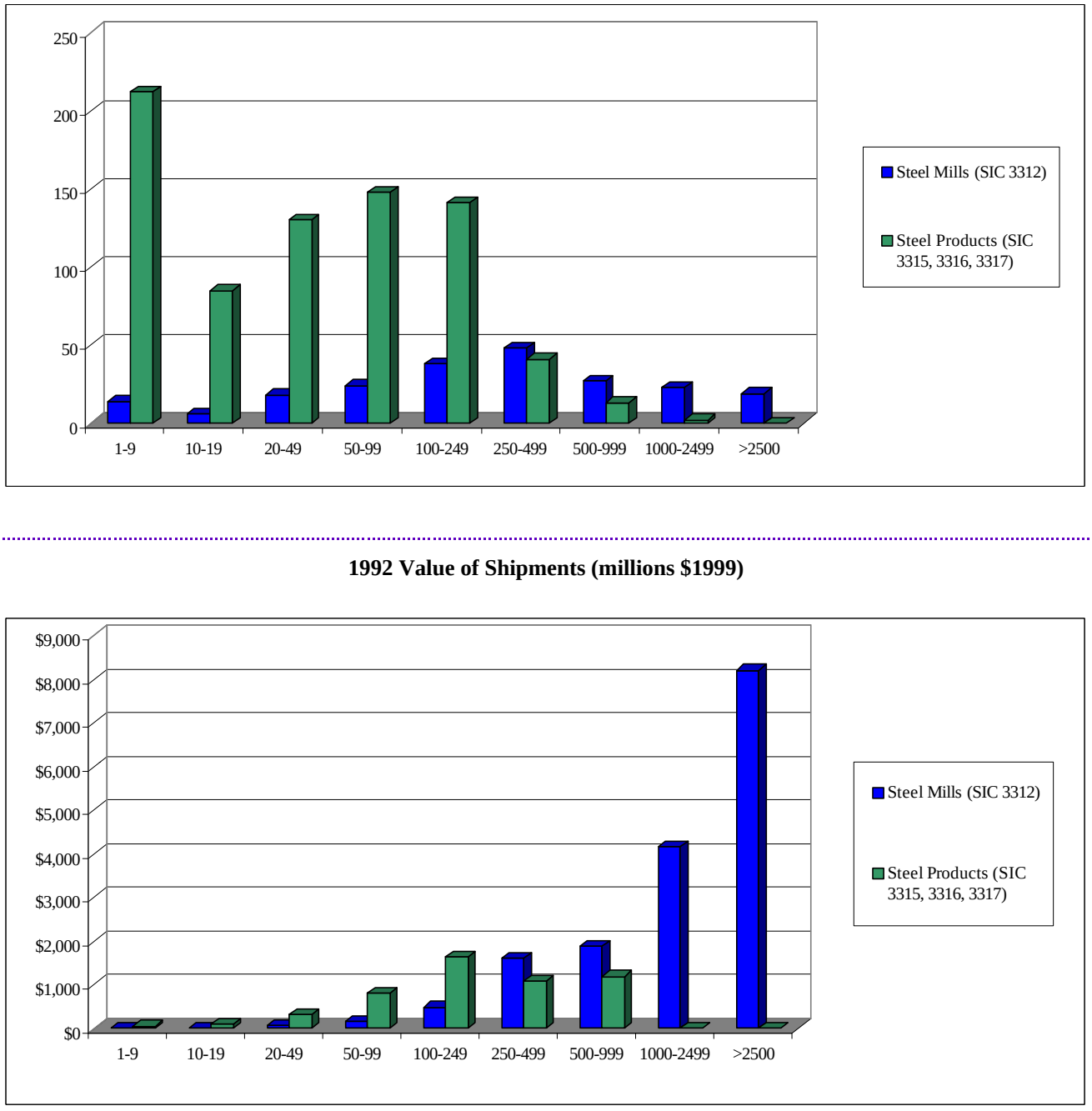
Source: Department of Commerce, Bureau of the Census, Census of Manufactures, 1992.

b. Facility Size

Steel making at both integrated mills and minimills is characterized by relatively large facilities, with 71 percent of all steel mills employing 100 or more employees. Figure 4D-6 shows that in 1992, the vast majority, approximately 98 percent, of the value of shipments for the industry was produced by facilities with more than 100 employees. Facilities with more than 1,000 employees accounted for approximately 69 percent of all steel mill shipments.

The Steel Products sector is characterized by smaller facilities than steel making with only 26 percent of facilities in the steel product industry employing 100 or more employees. While the majority of facilities in the Steel Products sector employ less than 100 people, most of the output from this sector is produced at the largest facilities. Figure 4D-6 shows that steel products facilities with more than 100 employees account for approximately 74 percent of the industry's shipments.

Figure 4D-6: Value of Shipments and Number of Facilities by Employment Size Category for the Profiled Steel Industry Sectors



Source: Department of Commerce, Bureau of the Census, Census of Manufactures, 1992.

c. Firm Size

The Small Business Administration (SBA) defines small firms in the profiled steelteel industries according to the firms' number of employees. Firms in both Steel Mills (SIC 3312) and Steel Products (SIC 3315, 3316, and 3317) sectors are defined as small if they have 1,000 or fewer employees. Table 4D-6 below shows the distribution of firms, facilities, and receipts by the employment size of the

parent firm.

The size categories reported in the Statistics of U.S. Businesses (SUSB) do not coincide with the SBA small firm standard of 1,000 employees. It is therefore not possible to apply the SBA size thresholds precisely. The SUSB data presented in Table 4D-6 show that in 1996, 316 of 397 firms in the Steel Mills sector had less than 500 employees. Therefore, at least 80 percent of firms in this sector were classified as small. These small firms owned 320 facilities, or 66 percent of all facilities in the sector, and accounted for approximately 6 percent of industry receipts. In contrast, the 34 largest firms that employ over 2,500 employees own 19 percent of all facilities in SIC 3312 and are responsible for approximately 77 percent of all industry receipts.

Of the 583 ultimate parent firms with facilities that manufacture steel products, 470, or 81 percent, employ fewer than 500 employees, and are therefore considered small businesses. Small firms own approximately 68 percent of facilities in the industry and account for 34 percent of industry receipts. The 49 large firms that employ over 2,500 employees own 100 of the 770 facilities in SIC codes 3315, 3316, and 3317 and are responsible for approximately 30 percent of all industry receipts.

Table 4D-6: Number of Firms, Facilities, and Estimated Receipts in the Profiled Steel Industry Sectors by Employment Size Category, 1996

Employment Size Category	Steel Mills (SIC 3312)			Steel Products (SIC 3315, 3316, 3317)		
	Number of Firms	Number of Facilities	Estimated Receipts ($1999 millions)	Number of Firms	Number of Facilities	Estimated Receipts ($1999 millions)
0-19	233	233	296,228	237	237	324
20-99	50	51	463,410	125	131	1,539
100-499	33	36	2,013,477	108	153	4,093
500-2,499	47	73	8,662,285	64	149	6,382
2,500+	34	90	38,343,865	49	100	5,397
Total	397	483	49,779,265	583	770	17,734

Source: Small Business Administration, Statistics of U.S. Businesses.

d. Concentration and Specialization Ratios

Concentration is the degree to which industry output is concentrated in a few large firms. Concentration is closely related to entry and exit barriers with more concentrated industries generally having higher barriers.

The four-firm ***concentration ratio*** (CR4) and the ***Herfindahl-Hirschman Index*** (HHI) are common measures of industry concentration. The CR4 indicates the market share of the four largest firms. For example, a CR4 of 72 percent means that the four largest firms in the industry account for 72 percent of the industry's total value of shipments. The higher the concentration ratio, the less competition there is in the industry, other things being equal.[2] An industry with a CR4 of more than 50 percent is generally considered concentrated. The HHI indicates concentration based on the largest 50 firms in the industry. It is equal to the sum of the squares of the market shares for the largest 50 firms in the industry. For example, if an industry consists of only three firms with market shares of 60, 30, and 10 percent, respectively, the HHI of this industry would be equal to 4,600 ($60^2 + 30^2 + 10^2$). The higher the index, the fewer the number of firms supplying the industry and the more concentrated the industry. An industry is considered concentrated if the HHI exceeds 1,000.

[2] Note that the measured concentration ratio and the HHF are very sensitive to how the industry is defined. An industry with a high concentration in domestic production may nonetheless be subject to significant competitive pressures if it competes with foreign producers or if it competes with products produced by other industries (e.g., plastics vs. aluminum in beverage containers). Concentration ratios are therefore only one indicator of the extent of competition in an industry.

The Steel Mills (SIC 3312) and Steel Products sectors (SICs 3315, 3316, 3317) are considered competitive, based on standard measures of concentration. The CR4 and the HHI for all the relevant SIC codes are below the benchmarks of 50 percent and 1,000, respectively. The concentration ratios presented in Table 4D-7 indicate that the majority of the output generated in these industry sectors is not concentrated in a few large firms. Moreover, the table shows that each of the industry sectors has became more competitive between 1987 and 1992.

The ***specialization ratio*** is the percentage of the industry's production accounted for by primary product shipments. The ***coverage ratio*** is the percentage of the industry's product shipments coming from facilities from the same primary industry. The coverage ratio provides an indication of how much of the production/product of interest is captured by the facilities classified in an SIC code.

The specialization and coverage ratios in Table 4D-7 show a high degree of specialization by steel mills indicating that the majority of production of steel mills is accounted for by primary product shipments.

Table 4D-7: Selected Ratios for the Profiled Steel Industry Sectors

SIC Code	Year	Total Number of Firms	Concentration Ratios					Specialization Ratio	Coverage Ratio
			4 Firm (CR4)	8 Firm (CR8)	20 Firm (CR20)	50 Firm (CR50)	Herfindahl-Hirschman Index		
Steel Mills									
3312	1987	271	44%	63%	81%	94%	607	98%	97%
	1992	135	37%	58%	81%	96%	551	98%	97%
Steel Products									
3315	1987	274	21%	34%	54%	78%	212	96%	88%
	1992	271	19%	32%	54%	80%	201	96%	88%
3316	1987	156	45%	62%	82%	95%	654	80%	94%
	1992	158	43%	60%	81%	96%	604	80%	95%
3317	1987	155	23%	34%	58%	85%	242	91%	92%
	1992	166	19%	31%	53%	80%	194	95%	97%

Source: Department of Commerce, Bureau of the Census, Census of Manufactures, 1992.

e. Foreign Trade

The global market for steel has become and still remains extremely competitive. From 1945 until 1960, the U.S. steel industry enjoyed a period of tremendous prosperity and was a net exporter until 1959. However, by the early 1960s, foreign steel industries had thoroughly recovered from World War II and had begun construction of new plants that were more advanced and efficient than the U.S. integrated steel mills. Foreign producers also enjoyed lower labor costs allowing them to take substantial market share from U.S. producers (S&P, 2000). This increased competition from foreign producers combined with decreased consumption in some key end use markets served as a catalyst for the restructuring and downsizing of the U.S. steel industry. The industry has emerged from this restructuring considerably smaller, more technologically advanced and internationally competitive.

This profile uses two measures of foreign competitiveness: ***export dependence*** and ***import penetration***. Export dependence is the share of value of shipments that is exported. Import penetration is the share of domestic consumption met by imports. Table 4D-8 presents trade statistics for the profiled steel industry sectors from 1989 to 1996. The table shows that the trends in both export dependence and import penetration have been relatively

stable. Historically, the U.S. steel industry has exported a relatively small share of shipments when compared to steel industries in other developed nations (McGraw-Hill, 1998). In 1995, U.S. exports rose to the highest level since 1941, yet steel exports only accounted for 7 percent of shipments that year. Imports as a percentage of implied domestic consumption rose slightly from 14 percent in 1993 to 17 percent in 1994 and remained at that level through 1996. This gradual increase in imports reflects excess steel capacity worldwide and the competitiveness of foreign steel producers.

Table 4D-8: Trade Statistics for the Profiled Steel Industry Sectors

Year	Value of imports ($1999 millions)	Value of exports ($1999 millions)	Value of Shipments ($1999 millions)	Implied Domestic Consumption[1]	Import Penetration[2]	Export Dependence[3]
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1989	9,844	3,058	59,203	65,990	15%	5.2%
1990	9,244	3,066	58,321	64,499	14%	5.3%
1991	8,767	4,064	53,958	58,662	15%	7.5%
1992	9,034	3,388	57,036	62,682	14%	5.9%
1993	9,662	3,104	60,099	66,657	14%	5.2%
1994	13,335	3,179	64,361	74,517	18%	4.9%
1995	12,178	4,616	65,147	72,709	17%	7.1%
1996	13,356	4,190	67,197	76,363	17%	6.2%
Average Annual Growth Rate	*4%*	*5%*	*2%*	*2%*	*2%*	*3%*

[1] Implied domestic consumption based on value of shipments, imports, and exports [column d + column b - column c].
[2] Import penetration based on implied domestic consumption and imports [column b / column e].
[3] Export dependence based on value of shipments and exports [column c / column d].

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures; U.S. Dept. of Commerce, Bureau of the Census, International Trade Administration. Outlook Trends Table, 1997.

4D.3 Financial Condition and Performance

The steel industry is generally characterized by relatively large plant sizes and technologically complex production processes which reflect the economies of scale required to manufacture steel efficiently. Because of the high fixed costs associated with steel manufacturing operations, larger production volumes are required to spread these costs over a greater number of units in order to maintain profitability. ***Operating margins*** for steel producers can be volatile due to changes in raw material costs, energy costs, and production levels (S&P, 2000).

Table 4D-9 presents trends in operating margins for steel mills and steel products manufacturers. The table shows that operating margins were relatively stable in both industry sectors between 1987 and 1996. The significant decrease in operating margins for steel mills and, to a lesser extent, steel products producers resulted from a significant decrease in steel consumption worldwide (McGraw-Hill, 1998).

Table 4D-9: Operating Margins for the Profiled Steel Industry Sectors (Millions $1999)

Year	Steel Mills (SIC 3312)				Steel Products (SIC 3315, 3316, 3317)			
	Value of Shipments	Cost of Materials	Payroll (all employees)	Operating Margin	Value of Shipments	Cost of Materials	Payroll (all employees)	Operating Margin
1987	$38,418	$22,782	$6,397	24.1%	$14,864	$9,591	$1,982	22.1%
1988	$44,371	$26,877	$6,558	24.6%	$16,460	$10,594	$2,015	23.4%
1989	$43,195	$26,140	$6,464	24.5%	$16,008	$10,481	$1,950	22.3%
1990	$42,301	$25,739	$6,746	23.2%	$16,020	$10,548	$2,039	21.4%
1991	$38,368	$24,249	$6,530	19.8%	$15,591	$10,341	$2,045	20.6%
1992	$40,699	$24,480	$6,783	23.2%	$16,337	$10,628	$2,184	21.6%
1993	$42,526	$25,547	$6,649	24.3%	$17,573	$11,322	$2,293	22.5%
1994	$46,046	$27,488	$6,612	25.9%	$18,314	$11,661	$2,253	24.0%
1995	$46,579	$27,962	$6,441	26.1%	$18,569	$12,131	$2,234	22.6%
1996	$48,773	$29,257	$6,668	26.3%	$18,424	$11,868	$2,319	23.0%
Percent Change 1987-1996	27%	28%	4%		24%	24%	17%	

Source: Department of Commerce, Bureau of the Census, Annual Survey of Manufactures.

4D.4 Facilities Operating Cooling Water Intake Structures

In 1982, the Primary Metals industries withdrew 1,312 billion gallons of cooling water, accounting for approximately 1.7 percent of total industrial cooling water intake in the United States. The industry ranked 3rd in industrial cooling water use, behind the electric power generation industry, and the chemical industry (1982 Census of Manufactures).

This section presents information from EPA's *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* on existing facilities with the following characteristics:

- they withdraw from a water of the United States;
- they hold an NPDES permit;
- they have an intake flow of more than two MGD;
- they use at least 25 percent of that flow for cooling purposes.

These facilities are not "new facilities" as defined by the proposed §316(b) New Facility Rule and are therefore not subject to this regulation. However, they meet the criteria of the proposed rule except that they are already in operation. These existing facilities therefore provide a good indication of what new facilities in these sectors may look like. The remainder of this section refers to existing facilities with the above characteristics as "§316(b) facilities."

a. Cooling Water Uses and Systems

Information collected in EPA's *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* found that an estimated 38 out of 158 steel mills (24 percent) and 13 out of 312 steel product manufacturers (4 percent) meet the characteristics of a §316(b) facility.

Minimills use electric-arc-furnace (EAF) to make steel from ferrous scrap. The electric-arc-furnace is extensively cooled by water and recycled through cooling towers (U.S. EPA, 1995).

Most §316(b) facilities in the profiled Steel sectors use cooling water for contact and non-contact production line or process cooling, electricity generation, and air conditioning:

- All §316(b) steel mills use cooling water for production line (or process) contact or noncontact cooling. The two other major uses of cooling water by steel mills are electricity generation and air conditioning, accounting for approximately 38 and 48 percent, respectively.

- All §316(b) steel product facilities use cooling water for production line (or process) contact or noncontact cooling. Electric generation and other uses are the two other uses of cooling water, both accounting for approximately 8 percent.

Table 4D-10 shows the distribution of existing §316(b) facilities in the profiled steel sectors by type of water body and cooling system. The table shows that most of the existing §316(b) facilities have either a once through system (22, or 43 percent) or employ a combination of a once through and closed system (21, or 40 percent). The largest proportion of existing facilities draw water from a freshwater stream or river (25, or 49 percent).

Table 4D-10: Number of §316(b) Facilities in the Profiled Steel Industry Sectors by Water Body Type and Cooling System Type

Water Body Type	Cooling Systems								
	Closed Cycle		Combination		Once Through		Unknown		Total
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	
Steel Mills (SIC 3312)									
Estuary or Tidal River	0	0%	0	0%	5	100%	0	0%	5
Freshwater Stream or River	1	4%	14	60%	5	23%	3	13%	24
Lake or Reservoir	1	13%	5	61%	2	26%	0	0%	9
***Total*†**	***2***	***6%***	***19***	***52%***	***13***	***34%***	***3***	***8%***	***38***
Steel Products (SIC 3315, 3316, 3317)									
Freshwater Stream or River	0	0%	0	0%	9	100%	0	0%	9
Lake or Reservoir	0	0%	1	100%	0	0%	0	0%	1
Lake or Reservoir/Freshwater Stream or River	3	100%	0	0%	0	0%	0	0%	3
***Total*†**	***3***	***23%***	***1***	***9%***	***9***	***69%***	***0***	***0%***	***13***
Total for Profiled Steel Industry (SIC 3312, 3315, 3316, 3317)									
Estuary or Tidal River	0	0%	0	0%	5	100%	0	0%	5
Freshwater Stream or River	1	3%	14	43%	14	44%	3	10%	33
Lake or Reservoir	1	11%	6	66%	2	23%	0	0%	10
Lake or Reservoir/Freshwater Stream or River	3	100%	0	0%	0	0%	0	0%	3
***Total*†**	***5***	***10%***	***21***	***40%***	***22***	***43%***	***3***	***6%***	***51***

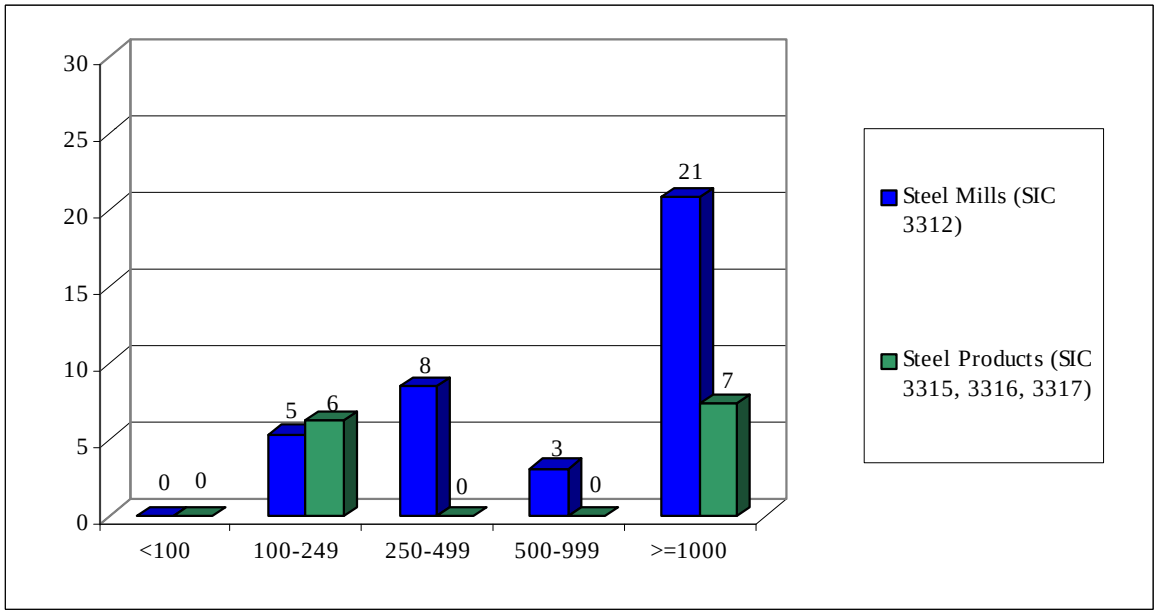
† Individual numbers may not add up to total due to independent rounding.

Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999.

b. Facility Size

The distribution of employment for both §316(b) steel mills and steel products facilities follow the same general pattern as employment distribution in their respective industries. Steel mills predominantly employ over 1,000 people while steel product manufacturers tend to be much smaller.

Figure 4D-7: Number of §316(b) Facilities in the Profiled Steel Industry Sectors by Employment Size



Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999.

d. Firm Size

EPA used the Small Business Administration (SBA) small entity size standards to determine the number of existing §316(b) profiled chemical industry facilities owned by small firms. Table 4D-11 shows that of the 38 §316(b) steel mills 22 percent are owned by small firms. There are no §316(b) steel product facilities that are owned by a small firm.

Table 4D-11: Number of §316(b) Facilities by Firm Size for the Profiled Steel Sectors

SIC Code	Large		Small		Total
	Number	% of SIC	Number	% of SIC	
Steel Mills (SIC 3312)					
3312	29	78%	8	22%	38
Steel Products (SIC 3315, 3316, 3317)					
3315	3	100%	0	0%	3
3316	9	100%	0	0%	9
3317	1	100%	0	0%	1
Total†	13	100%	0	0%	13
Total for Profiled Steel Facilities (SIC 3312, 3315, 3316, 3317)					
Total†	42	83%	8	17%	51

†Individual numbers may not add up to total due to independent rounding.

Source: EPA, Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, 1999; D&B Database.

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